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Zone 2 Neck Impalement: A Case Report and Review of Management

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Abstract

Penetrating Neck Injury (PNI) could cause significant mortality because of many vital structures packed in a relatively small area. Management of PNI is challenging and selective management has been considered the standard care with minimal risk to patient safety. Hereby the authors present a case of a 16-year-old male patient that was brought to the emergency department by ambulance following a motor accident with a penetrating, to-through-to left to the right side, wound of the neck caused by a large wooden part of a fence. We review the management of these types of injuries.

As soon as a patient with penetrating neck injury comes to the emergency room rapid assessment with the primary survey is essential. The goal of the primary survey by the Advanced Trauma Life Support (ATLS) protocol advocated by the American College of Surgeons is to establish a secure airway, assure breathing/respiration and initiate volume reuscitation. Once the patient is stabilized a second survey is carried out checking for symptoms and signs of subcutaneous emphysema, hoarseness, stridor, and respiratory distress and external injuries to the neck as hematoma, external bleeding, and air bubbling from a wound.

Surgical exploration was the principal form of treatment during past few decades but reports documenting the management of PNI have shown high rates of non therapeutic exploratory cervicotomies. Major signs and symptoms of vascular or aero digestive injuries should prompt emergent surgical exploration. The selective management based in physical examination and diagnostic studies is safe and feasible in stable patients decreasing the incidence of non therapeutic cervicotomies with low rates of morbidity. However foreign bodies must be removed in the operatory room with caution.

Keywords: Neck injury; Foreign bodies; Accidents; Trauma; Wounds

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Introduction

A Penetrating Injury of the Neck (PNI) is a wound that extend deep to the platysma. It represents 5% to 10% of trauma cases that present to the emergency department and their management is challenging [1,2]. No other region of the human body contains so many vital structures packed in a relatively small area. Mahmoodie et al. [2] reported that complications were reported in 9.3% of cases and the mortality rate was 1.5% [3]. Singh et al. [4] reported that current mortality rate for PNI is 3% to 6% and one of the most common complications is vascular trauma, occurring in 25% of cases, with mortality rates approaching 50% [4]. Injury to carotids and subclavian vessels carries a high incidence of mortality [5].

In this report we describe a patient who presented 16 years ago to the emergency department of San Bortolo Hospital in Vicenza with neck impalement through to through from the lateral side of the neck to the other side without neurovascular and organ lesions.

Case Presentation

A 16-year-old male patient was brought to the emergency department by ambulance following a motor accident with a penetrating, to-through-to left to the right side, wound of the neck caused by a large wooden part of a fence (Figure 1 and 2).

The patient was admitted directly to Intensive Care Unit: he was conscious, GCS was 14/15, the airway was clear and there was any apparent vascular or neurologic injury. There was neck edema without air leakage and subcutaneous emphysema. Systemic circulation appared stable and anesthetists decided to carry out a mini-tracheostomy after sedation and local anesthesia to secure the airway. A multidisciplinary team was assembled to draw up a treatment plan. After general

Figure 1: Admission of the Patient at our Hospital.

Figure 2: Mini tracheostomy performed.

Figure 3: The Wood Piece after Removal.

anesthesia the examination started with the aid of a flexible fiberscope to explore the larynx and pharynx that appeared intact. A lateral neck incision was performed on both sides of the neck along the anterior border of the sternocleidomastoid muscle to find the major vessels on the anterior triangle. The wood piece was then removed with caution without any free bleeding (Figure 3). On careful exploration there was the confirmation that the branch perfored only skin, subcutaneous layer and platysma without any lesion to the larynx, trachea and to the main vessels.

The wound was irrigated with povidone iodine and normal saline prior to closure in layers. An antibiotic treatment with ampicillin plus clavulanic acid and clindamycine was started. After 5 days the minitracheo was removed but two days later some swelling and erythema was noted around the wound and some pus was drained after the removal of sutures. The Patient was discharged on 8th postop day, but due to the minitracheo wound infection by gram-negative aerobe bacteria, it was necessary to follow him on daily basis at our clinic and to change antibiotics regimen three times. The wound healed by second intention after 40 days of treatment. Any neurologic dysfunctions occurred to cranial nerves.

Discussion

When assessing a penetrating neck injury the neck region can be divided into three areas according to the point of entry of the foreign body. Zone 1 extends from the level of the clavicles and sternal notch at the thoracic inlet to the cricoid cartilage. Zone 2 extends from the level of cricoid cartilage to the angle of the mandible. Zone 3 extends from the angle of the mandible to the base of skull [5,6]. Seven major body systems are confined within this relatively concentrated region of the body: the respiratory system, including the laringo-tracheal structures; the vascular system with the common, internal and external carotid arteries, the jugular venous system and the vertebral vessels; the nervous system, which include several cranial nerves and the spinal cord; the gastrointestinal system, including the oropharynx and esophagus; the endocrine system, including the thyroid and a parathyroid glands; the lymphatic system; the skeletal structures, including the vertebral column, mandible and hyoid bone. Therefore the presented case can be considered a Zone 2 wound. As soon as a patient with penetrating neck injury comes to the emergency room rapid assessment with the primary survey is essential. The goal of the primary survey by the Advanced Trauma Life Support (ATLS) protocol advocated by the American College of Surgeons is to establish a secure airway, assure breathing/respiration and initiate volume reuscitation. Once the patient is stabilized a second survey is carried out checking for symptoms and signs of subcutaneous emphysema, hoarseness, stridor, and respiratory distress and external injuries to the neck as hematoma, external bleeding, and air bubbling from a wound [7]. Almost 20% to 30% cases have laryngeal, tracheal or esophageal injury [5]. Particular importance should be placed on the airway because bleeding within the tight compartmentalized spaces of the neck may appear quiescent externally, but can cause progressive airway compromise and eventual complete obstruction. Orotracheal intubation is recommended but once the neck swelling is advanced endotracheal intubation may be impossible. Emergency cricothyrotomy or tracheostomy may be necessary to secure the airway [8]. Neurologic symptoms may include altered sensation, local motor defects or peripheral sensorimotor defects (as for brachial plexus injury). Absence of these signs and symptoms, however, does not mean absence of injury. Surgical exploration was the principal form of treatment during past few decades but reports documenting the management of penetrating neck injuries have shown high rates of non therapeutic exploratory cervicotomies. For this reason the most recent publications have highlighted the ongoing controversy about role of surgical exploration in the management of PNI [9-13]. Major signs and symptoms of vascular or aero digestive injuries should prompt emergent surgical exploration. The selective management based in physical examination and diagnostic studies is safe and feasible in stable patients decreasing the incidence of non therapeutic cervicotomies [14]. However foreign bodies must be removed in the operatory room with caution. CT angiogram is the first line modality with high sensivity and specificity for vascular and aerodigestive lesions [15-17]. Some authors have also reported Digital Subtraction Angiography (DSA) to be a useful tool for evaluation of PNI [18]. If findings are suggestive of vascular or neurovascular injury the Zone 2 requires an open surgical repair. If an aerodigestive tract injury is suspected endoscopic evaluation is needed with consequent surgical repair (Figure 4) [19]. Our patient has been extremely lucky not to have an injury of any vital structures of the neck. The treatment we performed was done according to what we thought, and still we do think, the safest procedures as possible. The minitracheo wound infection was an unexpected complication that made us to perform the following minitracheo directly in operating room, to reduce the possibility of infection.

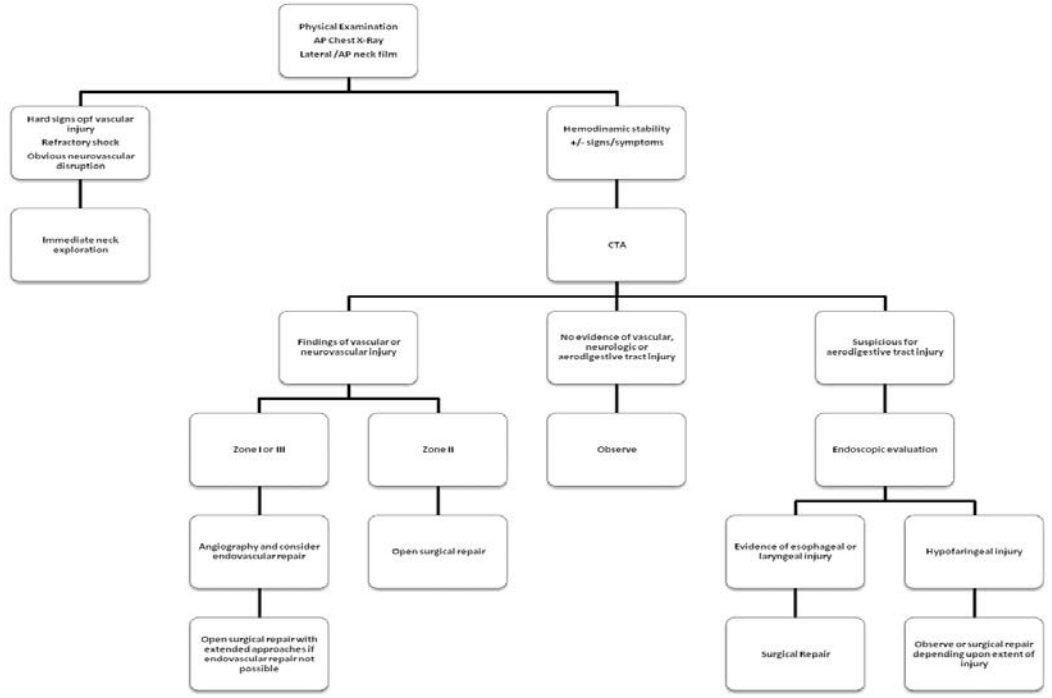

Figure 4: Legacy Emanuel Hospital and Health Center management guidlines for PNI.

Conclusion

PNI are complex and management is challenging coming with high morbidity and mortality rates. A high index of suspicion must be maintained for carotid injuries and major signs and symptoms of vascular or aeorodigestive injuries should prompt emergent surgical exploration. The selective management is safe and feasible decreasing the incidence of non therapeutic cervicotomies and their complications. After careful evaluation and interpretation simple removal of foreign bodies or stabbed material must be done with caution.

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